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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF APPEAL AND INTERFERENCES

In re Patent Application of

Hongyang Chao et al. — Date: August 19, 2004

Serial No.: 09/727,242 — Group Art Unit: 2623

Filed: November 30, 2000 — Examiner: T. Johnson

For: IMAGE COMPRESSION USING A INTEGER REVERSIBLE WAVELET TRANSFORM WITH A PROPERTY OF PRECISION PRESERVATION

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF UNDER 37 CFR §1.192

Sir:

Applicants appeal from the final rejection of all pending claims in the application provided in the Office Action dated August 19, 2003. The Notice of Appeal was filed in the United States Patent and Trademark Office on February 19, 2004.

Status of Claims

Claims 22-27, 29-30 and 32 are rejected and pending on appeal herein.

Real Party in Interest

The real party in interest is the assignee, Vianet Technologies, Inc.

Related Appeals and Interferences

The applicant, the assignee and the undersigned attorneys are not aware of any related appeals or interferences.

Status of Amendments

All amendments have been entered, the last amendment being a response after final rejection dated June 9, 2003.

Summary of the Invention

The present invention relates to a method and program for compressing a data file using a wavelet transformation that produces wavelet coefficients that are no greater in size than the original data elements that are transformed. In prior data compression methods using wavelet transformation, the resulting wavelet coefficients require twice as much storage space as the original transformed data elements. The nature of wavelet transformation typically exchanges the large number of small data elements for a smaller number of wavelet coefficients that each have a larger size and thus require a greater dynamic range of storage than each of the original data elements. The present invention reduces the larger dynamic range requirements for each wavelet coefficient by providing a wavelet transformation that operates on a modular arithmetic basis. According to this technique, arithmetic overruns normally associated with multiplication are avoided, so that the range of representation used for each of the wavelet coefficients is the same as that of each of the data elements. This technique results in less storage space requirements, smaller wavelet coefficients that can be transmitted more rapidly, and a faster coding/decoding (CODEX) for transforming image data.

Issues on Appeal

(A) Whether the specification provides proper antecedent basis for the claimed subject matter with respect to supporting the term "modular arithmetic."

(B) Whether claims 22-27, 29-30 and 32 comply with the written description requirement under 35 U.S.C. §112, first paragraph.

(C) Whether claims 22-27, 29-30 and 32 are indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention under 35 U.S.C. §112, second paragraph.

(D) Whether claims 22-24 and 32 are unpatentable under 35 U.S.C. §103(a) over U.S. Patent No. 6,144,773 to Kolarov et al. (hereinafter "Kolarov").

(E) Whether claims 25-26 are patentable over Kolarov in view of U.S. Patent No. 5,880,856 to Ferriere (hereinafter "Ferriere").

(F) Whether claims 27 and 29-30 are patentable over Kolarov and Ferriere in view of the disclosure entitled "An Image Multiresolution Representation for a Lossless and Lossy Compression," to Said et al. (hereinafter "Said I").

Grouping of Claims

Claims 22-24 stand or fall together as Group 1 with respect to the rejection under 35 U.S.C. §103(a) over Kolarov.

Claim 32 stands or falls alone as Group 2 with respect to the rejection under 35 U.S.C. §103(a) over Kolarov.

Claims 25-26 stand or fall together as Group 3 with respect to the rejection under 35 U.S.C. §103(a) over Kolarov in view of Ferriere.

Claims 27 and 29-30 stand or fall together as Group 4 with respect to the rejection under 35 U.S.C. §103(a) over Kolarov and Ferriere in view of Said I.

Argument

(A) Whether the specification provides proper antecedent basis for the claimed subject matter with respect to supporting the term "modular arithmetic"

The Office Action states that the specification does not support or define the term "modular arithmetic." Applicants note, however, that the specification provides specific definitions for operations involving modular arithmetic and cites a specific example of modular arithmetic commonly used in arithmetic machines, such as typical computers.

Pages 24-26 of the specification as originally filed, as well as pages B-26 - B-28 and pages B-39 - B-40 of the example appended to the specification illustrate the use of modular arithmetic to achieve an important feature of the present invention. On page 24 of the

specification, it is noted that the forward wavelet transform uses the same number of bits as the values of the signal pixels because of the complementary code property within the computer conducting the wavelet transformation operations. This preservation of precision is shown in detail on page 25 of the specification, for example, where an example of a computation with a bounded representation, i.e., modular, is provided. The result of the simple calculations shown are bounded by particular values when the calculation falls within certain ranges. The range of the integers a, b, c that are used in the simple computation is $[-2^{q-1}, 2^{q-1}-1]$. The use of this interval to bound the calculations involving the computations concerning the integers a, b and c is the definition of modular arithmetic. The specification goes on to point out that the internal representation of one of the integers, C_m, is provided as a two's complement number when it is outside the specified range. As is well known, two's complement arithmetic is a special case of modular arithmetic where a limited number of bits are used to represent a range of positive and negative numbers. A specific example of complementary code is provided on page 25 of the specification where, even if a number is calculated to be outside the range, it is written in complementary representation to fall within the range. The example given is for integer b = 2 (00000010) and the integer a = -127 (10000001), which is a twos complement representation of a negative number.

Indeed, applicants assertion that the specification provides support for the term "modular arithmetic" is bolstered by the definition relied on by the Examiner for modular arithmetic drawn from page 55 of Discrete Mathematics by Lipschutz et al. Lipschutz et al. define arithmetic modulo M mathematics as the arithmetic operations of addition, multiplication and subtraction where the arithmetic value is replaced by its equivalent value in the set {0, 1 ,2,...,M-1}or in the set {1, 2, 3,...,M}. The example given is for modulo 12 arithmetic where the results of all calculations are bounded between 1 and 12, or 0 and 11 depending upon how "noon" and "midnight" are defined in this "clock" arithmetic. This is the same arithmetic construct used in the present invention and described in the specification, particularly on pages 24-26 of the specification, where the represented values are all within the range of -127 to 128 in the example where 8 bits are used to represent the value. This is the same range represented abstractly by the interval $[-2^{q-1}, 2^{q-1}-1]$, mentioned above on page 25 of the specification. Accordingly, applicants

have specifically defined a modular arithmetic system, and in particular a two's complement arithmetic system upon which the present invention relies to obtain the advantageous results of a wavelet coefficient that is represented by a number of bits that are not any greater than the number of bits representing the original pixel signals. Using this modular arithmetic system, all arithmetic operations result in values that are within the specified range boundary for the modular arithmetic system, which can be represented by a number of bits that is no greater than the number of bits used to represent the operands of the arithmetic operations.

Applicants therefore respectfully submit that the specification provides broad and in-depth support for modular arithmetic, especially as used in the present invention and recited in claims 22 and 32 presently on appeal. Applicants therefore request that the objection to the specification be withdrawn.

(B) <u>Whether claims 22-27, 29-30 and 32 comply with the written description requirement under 35 U.S.C. §112, first paragraph.</u>

The Office Action states that claims 22-27, 29-30 and 32 are rejected under 35 U.S.C. §112, first paragraph, for failing to comply with the written description requirement, that the claims contain subject matter that was not described in the specification to reasonably convey possession of the claimed invention at the time the application was filed. In particular, the Office Action states that the term "modular arithmetic" does not appear in the originally filed specification. The Office Action also states that it is not clear from the originally filed specification how modular arithmetic is used or exactly what is intended by using the phrase "modular arithmetic."

Applicants note that, as discussed above with respect to the object to the specification, the recitation of the term "modular arithmetic" in the claims of the application reflect a simple and commonly used terminology that is readily apparent to one of ordinary skill in the art to indicate the use of a modular arithmetic system universally present in arithmetic machines, including computers. In the present case, particular features of modular arithmetic are used for computing wavelet coefficients where the wavelet coefficients are represented by a number of bits that are not greater than the number of bits used to represent data elements, as recited in claims 22-27,

29-30 and 32. That is, in agreement with modular arithmetic conventions, the results of the wavelet transform calculations are bounded within a particular range. Applicants submit that one of ordinary skill in the relevant art field would immediately understand that modular arithmetic refers to the use of an arithmetic system in which the computational operands and results are bounded according to a specified range, which is readily demonstrated on pages 24-26 of the originally filed specification, for example. Moreover, even if applicants had not described the modular arithmetic system at numerous points in the specification of the present application, it should be apparent that the regular and ordinary usage of the term "modular arithmetic" would apprise one of ordinary skill in the art in the relevant field that the arithmetic operations of addition, multiplication and subtraction are used with the operands to obtain an arithmetic value that is replaced by its equivalent value in the set represented by the modular range, as is aptly illustrated on page 55 of "Discrete Mathematics" by Lipschutz et al. Accordingly, applicants respectfully submit that the term "modular arithmetic" is used according to its customary and reasonable interpretation so that one of ordinary skill in the art in the relevant field would be certain as to the meaning conveyed with a reasonable degree of clarity. Applicants therefore, respectfully request that the rejection of claims 22-27, 29-30 and 32 under 35 U.S.C. §112, first paragraph be reversed.

(C) <u>Whether claims 22-27, 29-30 and 32 are indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention under 35 U.S.C. §112, second paragraph</u>

The Office Action states that claims 22-27, 29-30 and 32 are rejected under 35 U.S.C. §112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, the Office Action states that the phrase "modular arithmetic" used in claims 22 and 32 may be used by the claim to mean merely "integer arithmetic," which does not align with the accepted meaning illustrated on page 55 of "Discrete Mathematics" by Lipschutz et al.

Applicants first note that the use of the term "integer arithmetic" in the Office Action is a substantially broader term than the phrase "modular arithmetic" for all the reasons noted above with respect to the objection to the disclosure and the rejection of the claims under 35 U.S.C. §112, first paragraph. That is, integer arithmetic is not bounded with respect to a range, while modular arithmetic is definitely bounded with a specific range, which is the very nature of modular arithmetic systems. Applicants' position is further supported by the description of modular arithmetic provided on page 55 of "Discrete Mathematics" by Lipschutz et al., provided by the Examiner. Lipschutz et al. states that arithmetic modulo M refers to a bounded set of arithmetic values where arithmetic operations of addition, multiplication and subtraction result in a value that is within the set or replaced by an equivalent value within the set. This is exactly the definition of modular arithmetic provided and used in the specification, especially on pages 24-26. Indeed, the specification provides a particular example of modular arithmetic with illustration of the use of two's complement arithmetic. Accordingly, the term "modular arithmetic" is used in its customary and accepted language and is definite with a reasonable degree of certainty for one of ordinary skill in the art in the relevant field, especially in view of the support provided in the specification of the present invention and the reasonable and customary meaning of the term as illustrated by Lipschutz et al. Applicants therefore respectfully request that the rejection of claims 22-27, 29-30 and 32 under 35 U.S.C. §112, second paragraph be reversed.

(D) **<u>Whether claims 22-24 and 32 are unpatentable under 35 U.S.C. §103(a) over Kolarov</u>**

The Office Action states that claims 22-24 and 32 are rejected under 35 U.S.C. §103(a) as being unpatentable over Kolarov. In particular, the Office Action states that Kolarov teaches a wavelet transformation using modular arithmetic where each of the wavelet coefficients are represented by a number of bits with a maximum count no greater than a number of bits representing each of the data elements. This is one of the most important elements in applicants' invention and is the focus of applicants' arguments with respect to the disclosure by Kolarov.

Applicants first note that claims 22-24 and 32 represent separate concepts that are separately patentable, so that claims 22-24 and claim 32 should not stand or fall together. Claims 22-24 are directed to a method of compressing a data file involving a wavelet transformation, where the details of entropy encoding are described. Claim 32 is directed to a program for compressing a data file using a wavelet transformation routine. It should be apparent that a method for compressing a data file using a wavelet transformation is not specific to the mechanics or functionality of carrying out the method, while a program for compressing a data file using a wavelet transformation inherently calls for the use of a computational machine, such as a processor, on which the program can be executed. Accordingly, claims 22-24 and claim 32 each have separate scope and should not be considered to stand or fall together.

With respect to the rejections of claims 22-24 and claim 32 in Groups 1 and 2, respectively, applicants respectfully submit that Kolarov does not teach:

> performing a wavelet transformation of the data file using modular arithmetic to provide a series of wavelet coefficients, each of said coefficients being represented by a number of bits having a maximum count no greater than a number of bits representing each of said data elements; or
>
> a routine for performing a wavelet transformation of the data file using modular arithmetic to provide a series of wavelet coefficients, each of said coefficients being represented by a number of bits having a maximum count no greater than a number of bits representing each of said data elements,

as is recited in claims 22 and 32, respectively. Instead, Kolarov appears to rely on standard wavelet transformation algorithms that were known at the time of the Kolarov disclosure. The novel features purportedly disclosed by Kolarov focus on reorganizing and processing wavelet coefficients after they are produced through a conventional wavelet transform. That is, Kolarov focus on operations performed **after wavelet coefficients have been obtained through a standard wavelet transformation**. The reorganization and processing described by Kolarov is a technique for organizing significant bits of the wavelet coefficients to permit them to be transmitted over a communication medium in a shorter amount of time. This operation has

nothing whatsoever to do with the generation of wavelet coefficients through a wavelet transformation. Instead, Kolarov appears to simply explain that for each bit plane that is output, significance bits are determined that correspond to wavelet coefficients according to a G-tree hierarchy disclosed by Kolarov Accordingly, Kolarov never in fairness discuss a relationship between the number of bits in a data element and the number of bits in a wavelet coefficient derived from the image representation and indeed fail to discuss any other wavelet transformations than those that are conventionally known at the time of the Kolarov disclosure.

In the section entitled Response to Amendment in the final Office Action in section 10, the Examiner disagrees with the arguments provided by applicants in support of a conclusion of non-obviousness because Kolarov appears to teach that pixels may be represented by 8 or 12 bits, and Kolarov also appears to show a binary representation of a wavelet coefficient with 8 bits. The Examiner's reasoning appears to be founded on the notion that if Kolarov disclose a pixel represented by a number of bits N, and also discusses wavelet coefficients that are represented by a number of bits N, that the wavelet coefficients must have been produced from the pixels represented by N number of bits.

Applicants strongly contest this conclusion as being flawed for a lack of support in the disclosure by Kolarov, as well as being founded on tenuous or incorrect logic. Where applicants have recited a specific relationship between the data elements that are manipulated with the wavelet transformation of the present invention with specific recitations of the character of the wavelet transformation to produce specific wavelet coefficients, Kolarov simply appears to cite two unrelated and independent examples of bit representations of information. For example, in column 12, lines 35-42, Kolarov make the general statement that it is common to represent a pixel value by 8 bits, or perhaps 12 bits for values related to an x-ray image. In column 19, lines 25-54, Kolarov provides an example of determining significance bits from a predetermined wavelet coefficient, using an 8 bit wavelet coefficient as an example. There is no relationship between the examples of pixel value representations and examples of wavelet coefficient representations in these two separate portions of the disclosure by Kolarov Indeed, Kolarov fails to discuss any relationship between input data elements to a wavelet transformation and the resulting wavelet coefficients.

The only apparently related discussion provided by Kolarov with respect to producing wavelet coefficients from data elements in a data file is discussed in column 12, line 1 - column 13, line 61. In that discussion, Kolarov provides an example of input data elements represented by 8 or 12 bits, and a series of operations on the data file and data elements progressing to the generation of wavelet coefficients in step 320 of Figure 3a. The generation of wavelet coefficient is performed using a transformation fully described in a reference entitled "Spherical Wavelets: Efficiently Representing Functions on a Sphere", P. Schroder, W. Sweldens presented to SIG GRAPH on August 8, 1995. That is, Kolarov makes abundantly clear that the wavelet coefficients are generated using a prior art wavelet transformation taught by Schroder et al. in an earlier reference. The reference by Schroder et al. provides a wavelet transformation that generates wavelet coefficients that are **twice** the dynamic range of the input data elements. This result of wavelet coefficients that are larger than input data elements is natural in computational machines where the multiplication of two binary numbers results in a binary number with a dynamic range that is twice that of the operands. This convention is followed by Shroder et al. in producing their wavelet coefficients, and is adopted by Kolarov Accordingly, Kolarov at most teach wavelet coefficients that are twice as large as the input data elements, and any other reference to same-sized binary data is sheerly incidental.

That the Examiner seeks to interpret the disclosure by Kolarov to support the conclusion that Kolarov disclose wavelet coefficients that are no greater in size than input data elements is misplaced, and reads into the cited prior art reference of Kolarov that which it does not actually contain. To the extent that the Examiner concludes that Kolarov supplies sufficient evidence to establish a *prima facie* case of obviousness, applicants submit that the Examiner appears to rely on an incorrect standard for obviousness, often referred to as "obvious to try" test. Applicants submit that since Kolarov only appears to show examples of data elements having 8 or 12 bits, and unrelated examples of wavelet coefficients that have 8 bits, the Examiner may not conclude that one of ordinary skill in the art would understand how to derive one from the other in accordance with the present invention. That is, the Examiner should not be able to conclude that a *prima facie* case of obviousness exists against claims 22-24 and 32 based on Kolarov without resorting to an inappropriate standard for obviousness. Simply because it is known to represent

data elements by a number of bits and it is also known to represent unrelated wavelet coefficients by a number of bits that are coincidentally the same, it does not stand to reason that it would be obvious to connect the two through a wavelet transformation according to that disclosed in the present invention. That is, even given knowledge generally available to one of ordinary skill in the art, a general incentive does not make obvious a particular result. In re Deuel, 51 F.3d 1552, 34 USPQ2d 1210 (Fed. Cir. 1995). Even if one of ordinary skill in the art were able to glean from the disclosure by Kolarov that a novel wavelet transformation might be possible where the data elements are represented by a number of bits that are the same as the number of bits representing a corresponding wavelet transformation, such an observation would still not make the present invention recited in claims 22-24 and 32 obvious. The fact that a claimed invention may be well within the capabilities of one of ordinary skill in the art is not sufficient by itself to establish *prima facie* obviousness. In re Kotzab, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1318 (Fed. Cir. 2000); MPEP §2143.01. Applicants therefore respectfully submit that the Examiner has not used an appropriate test for obviousness to establish a *prima facie* case of obviousness, and that the disclosure by Kolarov lacks a number of elements that are recited in claims 22-24 and 32. Accordingly, the Examiner has not provided evidence or support for a *prima facie* case of obviousness against claims 22-24 or claim 32. In view of the lack of establishment of a *prima facie* case of obviousness, applicants respectfully request that the rejection of claims 22-24 and 32 be reversed.

(E) Whether claims 25-26 are patentable over Kolarov in view of Ferriere.

The Office Action states that claims 25-26 are rejected under 35 U.S.C. §103(a) over Kolarov in view of Ferriere. In particular, the Office Action states that while Kolarov does not necessarily provide for color transformation, the same is provided by Ferriere in an obvious combination.

The Office Action states that Kolarov suggests performing a color transformation of the data file prior to the wavelet transform in step 313 illustrated in Figure 3 and described in the last full paragraph in column 12. The Office Action also states that Kolarov does not necessarily provide for the color being transformed. Applicants assert that Kolarov fails to even suggest a

color transformation. The relevant portion of the disclosure indicated in the Office Action is for the identification of a function on a manifold, where the function describes characteristics of the image overlaid on the manifold. A color transformation, as indicated in the specification of the present application on page 7, for example, actually transforms a representation of color in an image to another color representative space. The specification illustrates transformations from RGB to YIQ, and RGB to YUV. The relationships between the conversion of RGB inputs into YIQ or YUV color spaces is specifically demonstrated in the application.

In contrast, Kolarov simply states that a function defined on the manifold is identified. An artisan of ordinary skill in the relevant art receives absolutely no suggestion or motivation with respect to a color transformation from the cited disclosure in Kolarov, and applicants submit that there is no support in Kolarov for the position taken in the Office Action. In this regard, applicants submit that the Examiner has failed to provide evidence of obviousness as is required to support a *prima facie* case of obviousness. MPEP §2142 ("The Examiner must provide evidence which as a whole shows that the legal determination sought to be proved (i.e., the reference teachings establish a *prima facie* case of obviousness) is more probable than not.).

Applicants also note that, as discussed above, Kolarov fails to disclose the performance of the wavelet transformation using modular arithmetic to produce wavelet coefficients represented by a number of bits no greater than the bits representing each of the data elements, as is recited in claims 25 and 26 due to their dependency on claim 22. Ferriere similarly fails to teach or suggest the modular arithmetic wavelet transformation recited in claims 25-26 through their dependency on claim 22. The cited prior art references of Kolarov and Ferriere therefore fail to teach or suggest all the claim limitations recited in claims 25-26, either alone or in combination, so that a *prima facie* case of obviousness may not be maintained against those claims.

Applicants also note that it would not be obvious to combine the disclosures by Kolarov and Ferriere in attempt to achieve the invention recited in claims 25-26 because the references fail to themselves teach or suggest their modification in accordance with the other reference. For example, if one of ordinary skill in the art were to attempt to modify Kolarov based on the teachings of Ferriere, they would be at a loss as to how to arrive at a color transformation,

because Kolarov fails to teach or suggest a color space to be transformed. Relevant portions of Kolarov cited in the Office Action describe the identification of a function that does not have any particular relevance to a color space, much less a transformation of a color space.

Indeed, the focus of Kolarov is to provide an improved technique for transmission of information representing an image by specifying and ordering particular bits derived from standard wavelet transformations of the image. That is, Kolarov discloses a technique for transmitting images that is apparently superior to that disclosed by Ferriere, which also uses old and known techniques for wavelet transformation. Accordingly, one of ordinary skill in the art would not be led to apply the teachings of Ferriere to Kolarov, simply because both disclosures are directed to the same overall subject matter and Kolarov provides an improvement of the subject matter over the teachings of Ferriere.

With regard to the rejection of claim 26, the Office Action states that Kolarov teaches or suggests sub-band orientation quantization, and cites a number of portions of the disclosure by Kolarov in support of this conclusion. The Office Action also states that Kolarov teaches quantization of the sub-bands as a function of the sub-band or wavelet tree, and further indicates that the quantization is a modification of the Said-Pearlman technique.

These statements in the Office Action are unsupported by the prior art references. Nowhere in the disclosure by Kolarov is sub-band orientation quantization discussed. Indeed, Kolarov states that while data compression typically includes the steps of transformation, quantization and encoding, no discussion of quantization is presented. Kolarov, column 8, lines 28-56. Indeed, the entire disclosure by Kolarov focuses particularly on the encoding step to the exclusion of the transformation and quantization steps. Accordingly, the disclosure by Kolarov fails to include any teaching or suggestion of sub-band orientation quantization, and one of ordinary skill in the art receives no motivation to arrive at this recitation found in claim 26 from the disclosure by Kolarov.

The Examiner references Said-Pearlman as providing a basis for quantization of a spatial orientation tree as modified by Kolarov. However, Kolarov makes no reference to quantization in any prior reference, and indeed is silent with respect to teachings or suggestions for quantization. In addition, a review of the reference by Said-Pearlman provides no teaching or

suggestion for any type of quantization oriented in a sub-band. Accordingly, no evidence in support of obviousness is presented in the disclosures by Kolarov or Said-Pearlman with respect to the recitation in claim 26, and applicants respectfully submit that a case of *prima facie* obviousness against claim 26 has not been established.

Applicants note that claim 26 depends upon claim 25, and therefore includes all of the limitations of claim 25, and should be allowable for all the same reasons, as well as for the inclusion of additional limitations in claim 26. Therefore, for all of the above reasons, applicants submit that a *prima facie* case of obviousness has not been established against claims 25 and 26. Accordingly, applicants respectfully request that the rejection of claims 25 and 26 under 35 U.S.C. §103(a) be reversed.

(F) Whether claims 27 and 29-30 are patentable over Kolarov and Ferriere in view of Said I.

The Office Action states that claims 27 and 29-30 are rejected under 35 U.S.C. §103(a) as being unpatentable over Kolarov and Ferriere and further in view of Said I. In particular, the Office Action states that Said I discloses an integer wavelet transformation, and that Kolarov shows the potential for using a lifting scheme in a wavelet transformation that is integer based.

Applicants note that claims 27 and 29-30 ultimately depend upon and further limit claim 26, which is thought to be allowable over the cited prior art references because the references do not teach or suggest all the claim limitations found in claim 26, as discussed above. Claims 27 and 29-30 include all the limitations of claim 26, and in addition recite further limitations so that they should be allowable for the same reasons as claim 26, as well as for the additional limitations recited in each claim.

For the above reasons, applicants respectfully submit that a *prima facie* case of obviousness against claims 27 and 29-30 is unsupported. Accordingly, applicants respectfully request that the rejection of claims 27 and 29-30 under 35 U.S.C. §103(a) be reversed.

Conclusion

In view of the foregoing discussion and evidentiary support presented, it is respectfully submitted that claims 22-27, 29-30 and 32 are clearly patentable over the cited prior art references and the knowledge available to one of ordinary skill in the art. Applicants therefore respectfully request that the Examiner's rejection of the claims be reversed and that the application be passed to issue.

Our Check No. 17857 which includes the amount $165.00 to cover the appeal brief is attached hereto. This brief is being submitted in triplicate in accordance with 37 CFR 1.192 and Applicants reserves the right to request an oral hearing upon receipt of the Examiner's Answer.

If this communication is being filed after a shortened statutory time period has elapsed and no separate petition is enclosed, the Commissioner of Patents and Trademarks is petitioned under 37 CFR §1.36(a) to extend the time for filing the required paper by the number of months which will avoid abandonment under 37 CFR §1.135. The fee under 37 CFR 1.17 should be charge to our Deposit Account No. 15-0700.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Mail Stop Appeal Brief - Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on August 19, 2004:

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CLAIMS ON APPEAL

Claims 1-21 (canceled).

22. A method of compressing a data file having data elements each represented by a number of bits, comprising:

performing a wavelet transformation of the data file using modular arithmetic to provide a series of wavelet coefficients, each of said coefficients being represented by a number of bits having a maximum count no greater than a number of bits representing each of said data elements;

discarding wavelet coefficients that fall below a predetermined threshold value;

quantizing remaining wavelet coefficients to provide a quantized series of wavelet coefficients; and

compressing the quantized series of wavelet coefficients to provide a compressed data file.

23. The method of claim 22 wherein the compressing step comprises the step of applying an entropy coding to the quantized series of wavelet coefficients.

24. The method of claim 23 wherein the entropy coding is selected from the group of arithmetic, Huffman, run length and Huffman run length combined.

25. The method of claim 23 further comprising the step of performing a color transformation of the data file prior to the wavelet transformation step.

26. The method of claim 25 wherein the quantizing step comprises sub-band orientation quantization.

27. The method of claim 26 wherein the wavelet transformation step comprises integer wavelet transformation.

Claim 28 (canceled).

29. The method of claim 27 wherein the integer wavelet transformation comprises biorthogonal filter method.

30. The method of claim 27 wherein the integer wavelet transformation comprises the correction method.

Claim 31 (canceled).

32. A program for compressing a data file having data elements each represented by a number of bits, comprising:

a routine for performing a wavelet transformation of the data file using modular arithmetic to provide a series of wavelet coefficients, each of said coefficients being represented by a number of bits having a maximum count no greater than a number of bits representing each of said data elements;

a routine for quantizing those wavelet coefficients which fall above a predetermined threshold value to provide a quantized series of wavelet coefficients; and

a routine for compressing the quantized series of wavelet coefficients to provide a compressed data file.